

# Analysis of AAT Near-Infrared Imaging Spectroscopy of the Impacts of SL9 with Jupiter

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We used the Infrared Imaging Spectrometer (IRIS) on the 39m Anglo-Australian Telescope to observe the collisions of 8 of the Comet Shoemaker-Levy 9 fragments with Jupiter. Fast rate 2.35  $\mu$ m photometry was taken for N and V. Spatially resolved 1  $\mu$ m band (1.98-2.38  $\mu$ m) spectra were obtained during the impacts of C, 1 D, G, 1 F, R and W. These spatially (0.6"/pixel) and temporally resolved (< 2 minutes or less) moderate-resolution (300  $\lambda/\Delta\lambda$ ) spectra provided detailed descriptions of the impact events, from the time the fragments entered the atmosphere, until their collapsed plumes rotated into view. Within the main infrared event, or splash, CH<sub>4</sub> emission at 2.20  $\mu$ m first seen ~6 minutes after the impact, and 6 minutes before strong emission from CO ( $\lambda > 2.29 \mu$ m) and H<sub>2</sub>O (2.0 and 2.3  $\mu$ m). The delayed appearance of the CO and H<sub>2</sub>O is probably consistent with high-energy, comet-rich ejecta, which attains a higher altitude, and has a longer flight time than Jovian material from the edge of the shock tube, which is ejected at lower velocities. We have used a line-by-line radiative transfer model to create synthetic spectra of the splash event in the range 2.0-2.4  $\mu$ m. The model includes emission from the gases CH<sub>4</sub>, NH<sub>3</sub>, CO and H<sub>2</sub>O. Preliminary results indicate that a splash containing ambient Jovian CH<sub>4</sub> abundances produces emission in excess of what is observed. This would imply either strong CH<sub>4</sub> self-absorption, or lower abundances of CH<sub>4</sub> in the splash. We also find that the high density of CH<sub>4</sub> emission lines in this region forms a 'pseudo-continuum' at the spectral resolution of the data, reducing the importance of particulate emission to explain the observed continuum. Results to date on derived absolute gas abundances will be presented, although this retrieval is complicated by the relatively large sampling interval between observations (40s--2 min) and the rapid cooling rates for the shock-heated Jovian stratosphere.

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